Chernobyl Disaster's Agricultural and Environmental Impact

Part two of a series

By Roberta C. Barbalace

Could it be that human invasion has a greater impact on the environment than the most catastrophic nuclear accident in the 20th century?

In 1986 the Chernobyl accident contaminated 125,000 square miles of land in Belarus, Russia and Ukraine with radionucleotides including cesium-137, strontium-90 and plutonium-239. It is too early to determine the long-term effects of the radioactive contaminants on the various affected habitats, because genetic changes are often not expressed in a general population for two or three generations. From early observations, however, the prognosis is much more promising than had originally been expected.

About 40% of the contaminated area was used for agriculture. The remainder was forest, bodies of water and urban centers. Plants and animals living in the 30-km exclusion zone received the highest level of radiation. Since radionucleotides migrate very slowly in soil, the radiation level in this region remains high. In Belrus 2,640 sq. km of farmland and 1,900 sq. km of forest have been taken out of use by humans forever; so predicted Igor V. Rolevich, Belarus first deputy minister for emergencies.

The Chernobyl accident took place during the growing season. It took only two weeks for the conifers to suffer significant damage from exposure. Initially many trees suffered sever damage to reproductive tissue.

Within three years of the accident, the trees had regained their reproductive functions. The forests have begun to thrive. Areas within the heart of the exclusion zone have the largest density of animals as well as the greatest diversity. Since people and their livestock do not enter the exclusion zone, there is not much overgrazing, no fires and no destruction. The grass is very deep and the habitat is doing very well. The area outside the exclusion zone has been so severely overgrazed by cattle that there is little grass. In addition, the trees have been cut for firewood, a stress factor that has not affected the exclusion zone.

One must avoid the temptation to become too overly optimistic about the rapid recovery of the contaminated area. Currently there is no standard by which to predict the long-term effects on populations, species or ecosystems.

Contamination of the soil by radionucleotides with long half-lives such as cesium-137 is a particular problem for the local residents near the Chernobyl Nuclear Reactor. These radionucleotides remain in the soil for a long while, is taken up by plants and transferred to the milk and meat products of cattle that graze the area. Human exposure could have been reduced by imposing strict countermeasures immediately following the release. Had local residents not worked in the field, or eaten fresh vegetables, and had they kept their livestock from eating the contaminated forage. Such measures need to be taken immediately, however, and they were not. Very specific countermeasures applied immediately can have a great bearing on the long term effects of a radioactive release. Changing the type of crop planted (each species has a different rate at which it absorbs specific chemical elements or compounds) or adding chemicals such as lime or potassium fertilizers can protect the population. In order for this to happen, residents have to be trained to respond, and the needed supplies must be readily available. No emergency procedure was in place for dealing with the catastrophe.

It is interesting that the water supply is not nearly as contaminated as the soil. The radionucleotides tend to settle out with time. Aquatic habitats also tend to be more tolerant of radioactive contamination. There is no evidence of any long term effects to the populations in the water near the nuclear reactor's cooling pond, which was the most contaminated body of water in the exclusion zone.

While the groundwater has not been contaminated to date, the Sarcophagus, which was built around Reactor Unit 4 is crumbling and there are many sites where radiation contaminated equipment were dumped.

While the environment in the exclusion zone seems to have recovered, it still has to deal with long term effects (such as genetic mutations, which may not surface for a few generations) and the real threat of another release of radioactivity should the integrity of the sarcophagus continue to disintegrate.

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Part three of a series

By Jesus E. Gomez

If societies worldwide want to continue using nuclear power, the benefits must be balanced against the risks!

Chernobyl's accident was a turning point for the nuclear power industry worldwide. According to World Association of Nuclear Operators (WANO), "It demonstrated clearly that nuclear power in some parts of the world was not safe enough." The association points out that the accident "caused such a negative opinion of nuclear energy that, should such an accident occur again, the existence and future of nuclear energy all over the world would be compromised."

On the International Nuclear Event Scale (INES), the Chernobyl nuclear accident rates the highest classification, which is level seven. The worst nuclear accident in the West, which was rated a level five by the INES, occurred in the pressurized water reactor at the Three Mile Island facility in Pennsylvania in 1979.

Chernobyl incidents are still happening but now are relatively minor compared to the two explosions occurred on April 26, 1986. For example, on Nov, 1995, a small amount of nuclear fuel leaked from the Unit 1 reactor and exposed a worker to about one year's permitted radiation dose.

Past experience indicates that there will be another Chernobyl-scale accident, World Health Organization (WHO) scientist Keith F. Baverstock suggests. The increasing

number of older reactors is especially a cause for concern.

According to David R. Kyd, director of the Division of Public Information at the International Atomic Energy Agency (IAEA), Vienna, Austria, "There are more than 430 nuclear reactors in the world, with more being built." More significantly, the number of reactors that are aging is inevitably increasing. The first nuclear reactor went online about 40 years ago.

The huge 300,000-metric-ton concrete and steel sarcophagus that was built at Chernobyl to entomb the destroyed reactor still contains uranium fuel. It is thought to include pellets and hot particles of enriched uranium dioxide, and three streams of solidified lava of fuel mixed with sand and concrete. The long-term stability of the sarcophagus is causing concern.

It is now generally accepted that the Chernobyl accident occurred, as WANO puts it, "because of a combination of the physics characteristics of the reactor, the design of the control rods, human error, and management shortcomings in the design and implementation of the [safety] experiment." The theory that accidents are rarely due to a single cause is well demonstrated here. Chernobyl "was an accident waiting to happen." Changes to the design on nuclear plants along with the implementation of administrative measures have improved safety conditions of operations. There have been other safety improvements since the accident, including the installation of emergency core-cooling systems and remote-control rooms in the first-generation Chernobyl-type, and better operation rules and procedures.

The nuclear industry has learned a number of things from Chernobyl. The most important is that it led to the formation of the World Association of Nuclear Operators, an organization that brougth together operators to look at safety and coordination of safety on a world scale.

Professor Sir Dillwyn Williams at the University of Cambridge said that, "If societies want to continue using nuclear power, the benefits must be balanced against the risks." Precautions must be taken to prevent those types of disasters from happening again. Although the environment seems to have recovered, right now we don't have a really good overview of the long-term effects on populations, species, or ecosystems.

Chernobyl Disaster From the Mouths of Children

From *Footprint of the Black Wind - written by children - 'Chernobyl in my destiny'* (Minsk 1995)

Irina Prokopenko - 9th grade

"In the days after the accident we were light-hearted and trusting, we inhabitants of the contamination zone. We lived the same lives as before. Children played out in the radioactive rain; we ate pies off open stalls, went to the woods; the grown-ups worked in the fields... I am now 17, and for seven years have lived with thyroid disease..."

Natalla Jarmolenko - 11th grade

"...Last year one of my classmates, my friend Maja Kasajed, died. The whole school gave her a send-off like a bride. We all stood outside the schoolhouse, and the head-mistress rang the bell for Maja, for the end of the last lesson of her short life..."

Yelena Kulazhenko - 10th grade

Chernobyl called my dad too. He worked for the Department of Internal Affairs...in the 30 km (exclusion) zone...He came home with a voice that was strange and dry. He drank lots of mineral water; that's what the doctors prescribed. He told us about empty villages of Palessia, the domestic animals howling crazily in the roads... In 1989 they gave Dad a terrible diagnosis: cancer of spinal marrow... Doctors in Minsk refused to operate... Soviet people in Moscow refused to treat him...Dad was two months in a hospital in Michigan. Dad came back full of hope. Enchanted, we listened to his tales about the strange but sympathetic and kind people he had met in that far-off land... (Moscow) refused follow up treatment. He began to get worse... On March 28th (1993) he died... That's how (Chernobyl) took away my Dad. And it took away my birthday too; Dad died exactly on the day I reached 14."

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